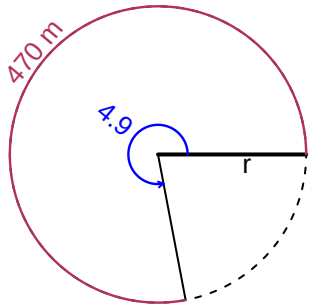
Name: Date:

Trig Final (Solution v29)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 4.9 radians. The arc length is 470 meters. How long is the radius in meters?

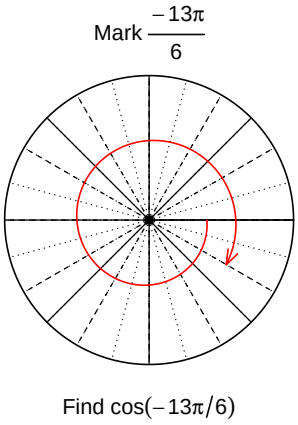


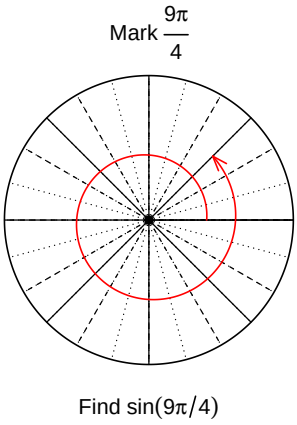
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 95.92$ meters.

Question 2

Consider angles $\frac{-13\pi}{6}$ and $\frac{9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-13\pi}{6}\right)$ and $\sin\left(\frac{9\pi}{4}\right)$ by using a unit circle (provided separately).





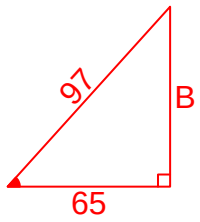
$\cos(-13\pi/6) = \frac{\sqrt{3}}{2}$

$\sin(9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-65}{97}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

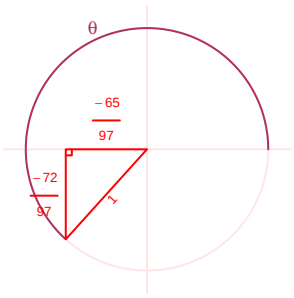
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$65^2 + B^2 = 97^2$$
$$B = \sqrt{97^2 - 65^2}$$
$$B = 72$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-72}{97}}{\frac{-65}{97}} = \frac{72}{65}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 2.08 meters, a midline at $y = 4.72$ meters, and a frequency of 8.41 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.08\cos(2\pi 8.41t) + 4.72$$

or

$$y = 2.08\cos(16.82\pi t) + 4.72$$

or

$$y = 2.08\cos(52.84t) + 4.72$$